

Estimating Air Pollution Improvements and Better Health due to Climate Change Policy

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Climate Policy and Improvements in Health

- Carbon dioxide contributes to climate change, but it does not commonly cause poor health
- However, carbon dioxide *policy* can reduce poor health by reducing sulfur dioxide and other emissions

Co-Benefits Risk Assessment Model (COBRA)

The screenshot shows the 'New York State COBRA' application window. The title bar reads 'Co-Benefits Risk Assessment Model (COBRA)'. The menu bar includes 'File', 'View', and 'Help'. The interface is divided into a left sidebar and a main content area. The sidebar has a header 'New York State COBRA' and a section 'Scenario Options'. Under 'Scenario Options', there is a label 'Run a new scenario:' followed by two radio buttons: 'statewide' (selected) and 'for individual counties:'. Below the radio buttons is a list box containing the following counties: Albany, Allegany, Bronx, Broome, Cattaraugus, Cayuga, Chautauqua, Chemung, and Chenango. At the bottom of the sidebar are two buttons: 'Start' and 'Go'. The main content area has a tabbed interface with 'Overview' and 'Emissions' tabs. The 'Overview' tab is active, displaying a welcome message: 'Welcome to the New York State Co-Benefits Risk Assessment Model (COBRA)'. Below this, it says 'To begin using COBRA, you may:' followed by two numbered steps: '1) Explore the baseline emissions data.' and '2) Create your own scenario.' Each step has a descriptive paragraph. Step 1 explains that baseline data can be accessed in table and map form via the 'Emissions' button. Step 2 explains that users can create a new scenario or retrieve a saved one through the left panel.

Co-Benefits Risk Assessment Model (COBRA)

File View Help

New York State COBRA

Scenario Options

Run a new scenario:

☒ statewide

☐ for individual counties:

- ☐ Albany
- ☐ Allegany
- ☐ Bronx
- ☐ Broome
- ☐ Cattaraugus
- ☐ Cayuga
- ☐ Chautauqua
- ☐ Chemung
- ☐ Chenango

Start

Retrieve a saved scenario definition:

Go

Overview Emissions

Welcome to the New York State Co-Benefits Risk Assessment Model (COBRA)

To begin using COBRA, you may:

1) Explore the baseline emissions data.

This data can be accessed in table and map form by clicking on the "Emissions" button above. Viewing the baseline data first can help you decide what changes you want to make in your own scenario.

2) Create your own scenario.

You can create a new scenario through the left panel of this page. You may either run an entirely new scenario or retrieve a previously saved one to use as a template.

Quantifying Health Improvements

- User inputs reductions in air emissions such as sulfur dioxide and nitrogen oxides
- COBRA quantifies the associated reduction in particles, and the improvement in people's health

Why Focus on Particles?

- Particles have been linked with the most serious health effects
 - Premature mortality, Chronic bronchitis, Hospital admissions and Asthma

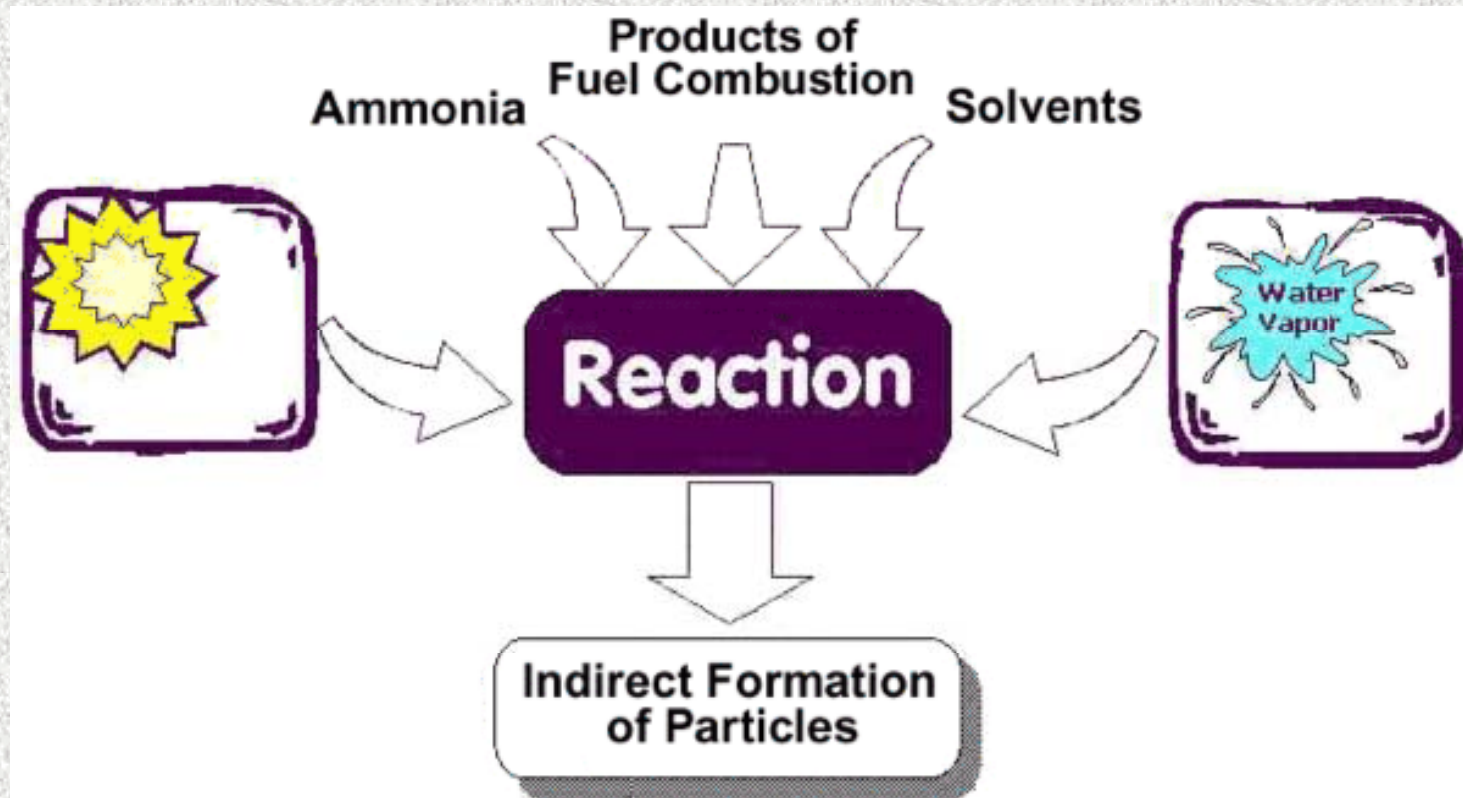
Particles & Poor Health

- EPA studies show many affected by particles
 - Clean Air Act prevented 23,000 premature deaths and 20,000 cases of chronic bronchitis
 - Improved heavy duty diesel emission standards prevented 8,000 premature deaths and 5,000 cases of chronic bronchitis
- Still room for improving health by reducing particles

Sources of Particles

- Direct
 - Combustion (also wind erosion, road dust, construction)
- Indirect Formation in the Atmosphere from Gases

Indirect Formation of Particles



1. User Calculates the Emission Reduction from Climate Change Policy

- Use the CAP software, your own independent estimates, etc.
- Estimate reductions in sulfur dioxide, nitrogen dioxide, particles and volatile organic carbons
 - These contribute directly (or indirectly) to particles in the air

2. COBRA Calculates Particle Formation

- COBRA incorporates the user-defined emission changes into a relatively simple air quality model used by EPA in previous analyses, such as the NOx SIP call
 - There are more sophisticated models, however this model provides inexpensive, reasonably good ballpark estimates

3. COBRA Calculates Reduction in Poor Health

- COBRA uses mathematical functions to link the estimated change in particles with the latest epidemiological studies
 - Premature mortality, Chronic bronchitis, Hospital Admissions, and Asthma

Air Pollution Emissions Data in COBRA

- COBRA contains 2007 air emissions data specific to one state, such as New York
 - Sulfur dioxide, nitrogen oxides, etc.
 - Displays data down to the county level

Data can be viewed as tables...

Co-Benefits Risk Assessment Model (COBRA)

File View Help

New York State
COBRA

Base Emissions
Table Options

Current table:
Data for: New York State
Divided by: County

View new table by:

---choose view---

---choose view---
State total - by county
State total - by category
Albany
Allegany
Bronx
Broome
Cattaraugus

Overview **Emissions**

Base Emissions: Tables | Base Emissions: Maps

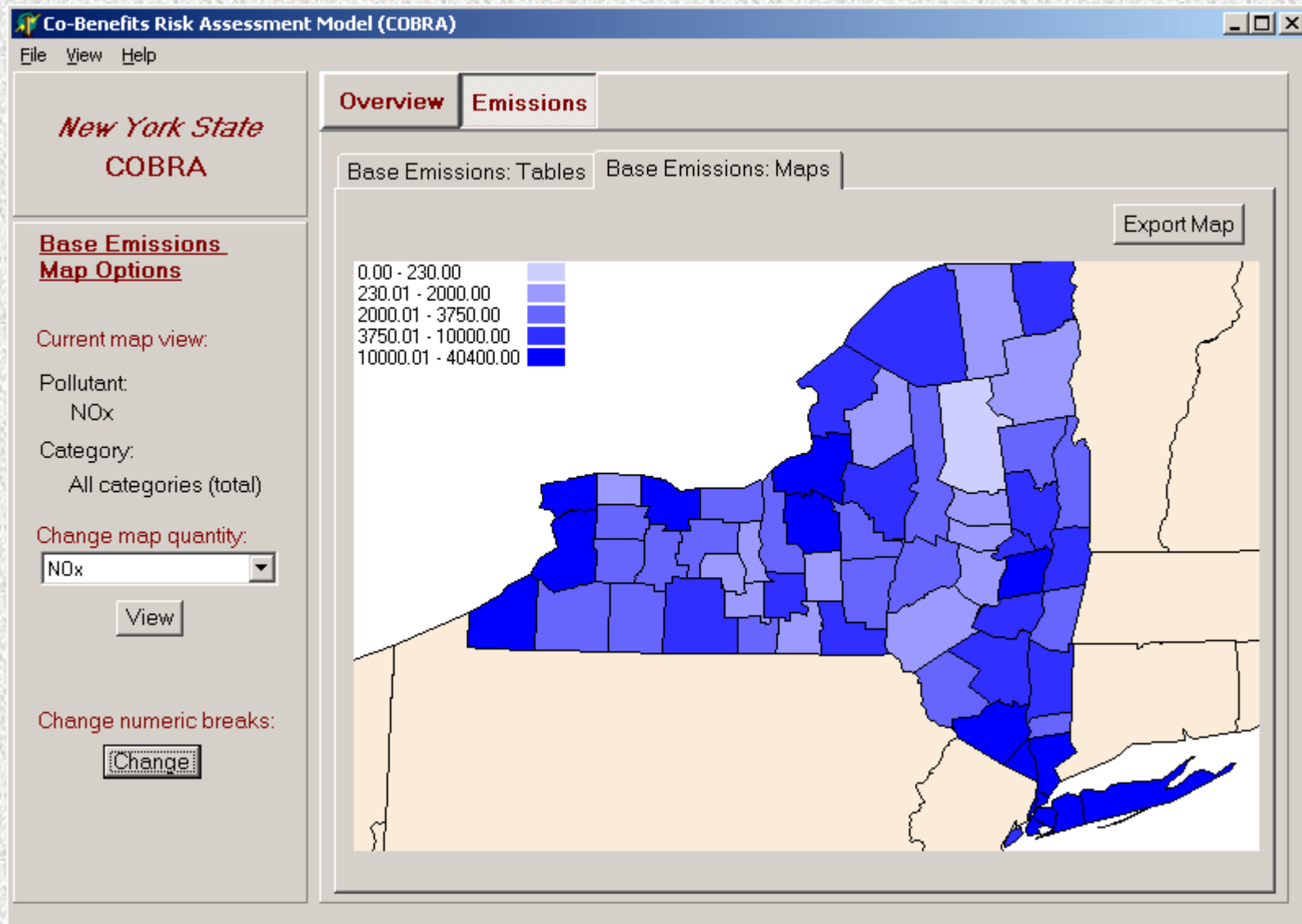
Export All Emissions Data

Summary of data for: New York State

COUNTY	PMC	PM25	SO2	NOX
▶ State Total	225651.4657	141273.9555	507982.1261	531564.5585
Albany	8452.8006	18944.9667	4438.5319	12943.0738
Allegany	1346.2815	701.6243	409.8438	2154.7623
Bronx	8350.7601	5102.586	9397.5637	18164.6718
Broome	4814.1393	2203.8116	10061.3227	9290.6522
Cattaraugus	2045.3502	1267.8117	1193.2543	3719.3793
Cayuga	2031.0982	1329.592	1118.6099	3272.2078
Chautauqua	2500.4265	1481.7563	52402.4006	10834.7538
Chemung	1440.2354	736.4414	1035.6597	3162.6077
Chenango	1453.191	804.4342	973.4985	2235.5408
Clinton	2043.2045	1231.1936	1897.7732	4135.8875
Columbia	1650.8051	667.9596	487.8	2472.8282
Cortland	1092.6998	575.6597	612.0054	1513.0054
Delaware	1186.9601	706.9209	631.8872	1873.7514

Note: All values are in tons of emissions. Data represent estimates for 2007.

...and as interactive maps



User has Flexibility to Define Emission Reductions

- User determines changes in emissions and enters them into COBRA
 - User enters percentage reduction or tons of emission reduced
 - Sulfur dioxide, nitrogen oxides, volatile organic carbons, particles, and ammonia

Example Scenario Calculation

- Shift to wind energy in New York, leading to a 10 % reduction in emissions in the Electric Utility Sector



To define this scenario:

Define scenario

New York State

Currently active category:
[No selected category]

Edit this category's emissions:

PM Coarse: ☒ reduce by [enter amount] ☒ percent tons
☐ increase by [enter amount] ☐ tons

☒ Fuel Comb. Elec. Utility
☐ Fuel Comb. Industrial
☐ Fuel Comb. Other
☐ Chemical & Allied Product Mfg
☐ Metals Processing
☐ Petroleum & Related Industries
☐ Other Industrial Processes
☐ Solvent Utilization
☐ Storage & Transport
☐ Waste Disposal & Recycling
☐ Highway Vehicles
☐ Off-Highway
☐ Natural Sources
☐ Miscellaneous

Navigate the category tree to find the Electric Utilities Category Group

VOC: ☒ reduce by [enter amount] ☒ percent tons
☐ increase by [enter amount] ☐ tons

Apply Edits

<-- Back Summarize Edits Run Scenario -->

Define scenario

New York State

Currently active category:
Fuel Comb. Elec. Utility

- Fuel Comb. Elec. Utility
 - Coal
 - Gas
 - Internal Combustion
- Fuel Comb. Industrial
- Fuel Comb. Other
- Chemical & Allied Product Mfg
- Metals Processing
- Petroleum & Related Industries
- Other Industrial Processes
- Solvent Utilization
- Storage & Transport
- Waste Disposal & Recycling
- Highway Vehicles

Edit this category's emissions:

PM Coarse: ☒ reduce by 10 ☐ increase by ☐ percent ☐ tons

PM 2.5: ☒ reduce by 10 ☐ increase by ☐ percent ☐ tons

SO2: ☒ reduce by 10 ☐ increase by ☐ percent ☐ tons

NOx: ☒ reduce by 10 ☐ increase by ☐ percent ☐ tons

NH3: ☒ reduce by 10 ☐ increase by ☐ percent ☐ tons


VOC: ☒ reduce by 10 ☐ increase by ☐ percent ☐ tons

...then Apply Edits... → **Apply Edits**

...and run the scenario. → **Run Scenario -->**

<-- Back

Scenario Results: Air Quality


Co-Benefits Risk Assessment Model (COBRA)

File View Help

New York State
COBRA

Air Quality
Table Options

 Current table:
 Scenario Name:
 Wind Power Scenario

 View:
 New York

 View new table by:

---choose state---

View

Overview Emissions **Scenario 1**

Scenario Emissions: Tables Air Quality: Tables Health Effects: Tables Results: Maps

Export Table

	FIPS	County	CtrlPM25	BasePM25	DeltaPM25	CtrlPM10	BasePM10
	36063	Niagara	25.14415	25.17481	0.03066	33.50681	33.55097
	36061	New York	60.00087	60.02196	0.02109	111.57823	111.60214
	36059	Nassau	38.33709	38.37072	0.03363	75.95525	76.00007
	36057	Montgomery	14.68699	14.70819	0.0212	20.74783	20.77244
	36055	Monroe	19.49002	19.55057	0.06055	29.52169	29.58653
	36053	Madison	15.12932	15.15694	0.02762	21.52367	21.5587
	36051	Livingston	14.81169	14.83862	0.02693	20.61362	20.64355
	36049	Lewis	14.05404	14.08808	0.03404	18.69664	18.73661
	36047	Kings	61.60775	61.62835	0.0206	125.77175	125.79553
	36045	Jefferson	13.62078	13.6575	0.03672	18.2042	18.25076
	36043	Herkimer	13.97183	14.00557	0.03374	18.70928	18.74805
	36041	Hamilton	13.21807	13.24811	0.03004	17.2926	17.32585
	36039	Greene	15.5519	15.57979	0.02789	22.80785	22.8392
▶	36037	Genesee	17.01275	17.03973	0.02698	23.84449	23.87673

Note: All values are in ug/m3. Data represent estimates for 2007.

Scenario Results: Health Effects

Co-Benefits Risk Assessment Model (COBRA)

File View Help

New York State
COBRA

Health Effects Table Options

Current table:
Scenario Name:
Wind Power Scenario

View:
New York

View new table by:
---choose state---

View

Overview Emissions Scenario 1

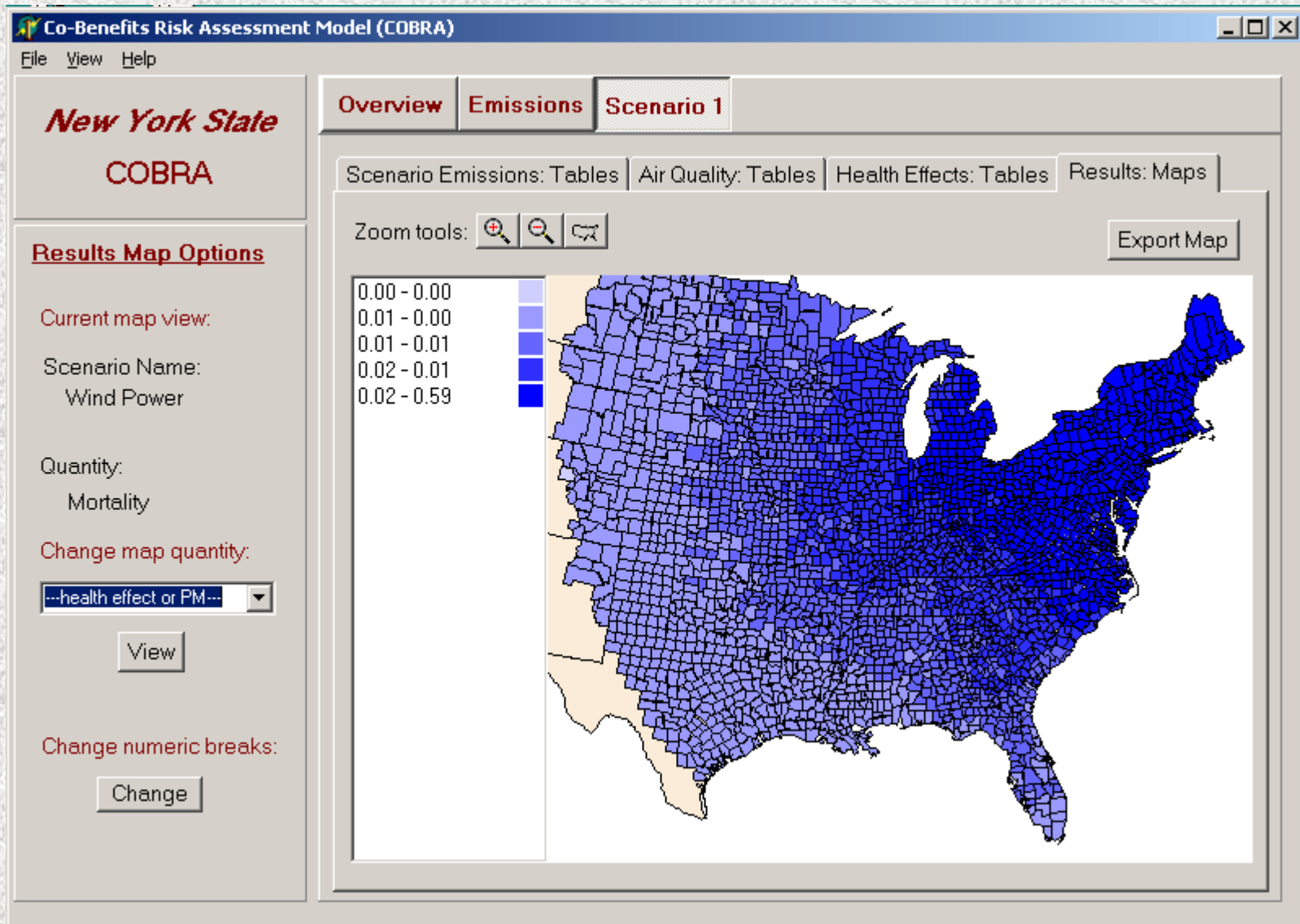
Scenario Emissions: Tables Air Quality: Tables Health Effects: Tables Results: Maps

Export Table

County	Mortality	Chronic_Bron	Resp_hosp	CV_hosp	UpperResp_Symp	Low
Montgomery	0.16789	0.03237	0.02508	0.02806	1.00954	
Monroe	0.35028	1.19311	0.77742	0.76846	41.787	
Madison	0.15391	0.06202	0.03732	0.03808	2.05274	
Livingston	0.14897	0.04861	0.02898	0.02762	1.51986	
Lewis	0.19042	0.02783	0.01823	0.01889	1.04098	
Kings	0.12152	1.33534	0.84444	0.82237	50.28525	
Jefferson	0.2283	0.1196	0.07103	0.06932	4.38757	
Herkimer	0.24249	0.06591	0.04674	0.05049	2.01443	
Hamilton	0.20472	0.00534	0.00413	0.0047	0.09054	
Greene	0.1924	0.04124	0.02733	0.0286	1.20617	
Genesee	0.1719	0.05078	0.03298	0.03463	1.72638	
Fulton	0.21335	0.04955	0.03385	0.03584	1.49413	
Franklin	0.15497	0.0361	0.02176	0.02121	1.05868	
Essex	0.19331	0.03137	0.02113	0.02229	0.89217	

Note: All values represent the change in health effect per person.
Data represent estimates for 2007.

Scenario Results: Mapping Tool



Availability and Information

- Abt Associates is developing pilot models for several states under direction of the EPA State and Local Climate Change Program
- For more information contact Denise Mulholland: mullholland.denise@epa.gov